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U.S. Army Toxic and Hazardous Materials Agency



**Enhanced Preliminary
Assessment Report:**

**Beverly Army Housing Units
Beverly, Massachusetts**

September 1989

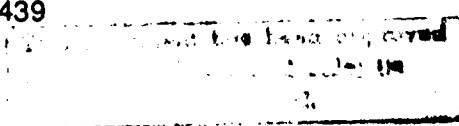
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Commander
U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, Maryland 21010-5401

prepared by

Environmental Research Division
Argonne National Laboratory
Argonne, Illinois 60439



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CETHA-BC-CR-89259

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Beverly Army Housing Units

Beverly, Massachusetts

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Aberdeen Proving Ground, Maryland 21010-5401**



**Environmental Research Division,
Argonne National Laboratory, Argonne, Illinois 60439-4815**

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SUMMARY

The Beverly housing facility does not represent any imminent or substantial threat to human health or the environment and, consequently, no immediate remedial actions are necessary. Although originally constructed in 1958 as part of the Nike missile antiaircraft defense network, this area has always been used solely for housing military personnel, and no missile-related wastes were ever delivered to or managed at this property.

No problem associated with the collection and disposal of garbage for the facility was reported. No sewerage problems were identified. Water-pipe insulation inside the housing units may contain asbestos. However, the insulation is in excellent condition and does not need to be removed.

No adverse environmental impacts have been identified and no additional investigations are warranted. No actions are recommended prior to excessing this property.

1 INTRODUCTION

In October 1988, Congress passed the Defense Authorization Amendments and Base Closure and Realignment Act, Public Law 100-526. This legislation provided the framework for making decisions about military base closures and realignments. The overall objective of the legislation is to close and realign bases so as to maximize savings without impairing the Army's overall military mission. In December 1988, the Defense Secretary's ad hoc Commission on Base Realignment and Closure issued its final report nominating candidate installations. The Commission's recommendations, subsequently approved by Congress, affect 111 Army installations, of which 81 are to be closed. Among the affected installations are 53 military housing areas, including the Beverly housing area addressed in this preliminary assessment.¹

Legislative directives require that all base closures and realignments be performed in accordance with applicable provisions of the National Environmental Policy Act (NEPA). As a result, NEPA documentation is being prepared for all properties scheduled to be closed or realigned. The newly formed Base Closure Division of the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) is responsible for supervising the preliminary assessment effort for all affected properties. These USATHAMA assessments will subsequently be incorporated into the NEPA documentation being prepared for the properties.

This document is a report of the enhanced preliminary assessment (PA) conducted by Argonne National Laboratory (ANL) at the Army stand-alone housing area in Beverly, Mass.

1.1 AUTHORITY FOR THE PA

The USATHAMA has engaged ANL to support the Base Closure Program and assess the environmental quality of the installations proposed for closure or realignment. Preliminary assessments are being conducted under the authority of the Defense Department's Installation Restoration Program (IRP); the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 91-610, also known as Superfund; the Superfund Amendments and Reauthorization Act of 1986, Public Law 99-499; and the Defense Authorization Amendments and Base Closure and Realignment Act of 1988, Public Law 100-526.

In conducting preliminary assessments, ANL has followed the methodologies and procedures outlined in Phase I of the IRP. Consequently, this PA addresses all documented or suspected incidents of actual or potential release of hazardous or toxic constituents to the environment.

In addition, this PA is "enhanced" to cover topics not normally addressed in a Phase I preliminary assessment. Specifically, this assessment considers and evaluates the following topical areas and issues:

- Status with respect to regulatory compliance,
- Asbestos,
- Polychlorinated biphenyls (PCBs),
- Radon hazards (to be assessed and reported on independently),
- Underground storage tanks,
- Current or potential restraints on facility utilization
- Environmental issues requiring resolution,
- Health-risk perspectives associated with continued residential land use, and
- Other environmental concerns that might present impediments to the expeditious "excessing," or transfer and/or release, of federally owned property.

1.2 OBJECTIVES

This enhanced PA is based on existing information from Army housing records of initial property acquisition, initial construction, and major renovations and remodeling performed by local contractors or by the Army Corps of Engineers. The PA effort does not include the generation of new data. The objectives of the PA include:

- Identifying and characterizing all environmentally significant operations (ESOs),
- Identifying property areas or ESOs that may require a site investigation,
- Identifying ESOs or areas of environmental contamination that may require immediate remedial action,
- Identifying other actions that may be necessary to address and resolve all identified environmental problems, and
- Identifying other environmental concerns that may present impediments to the expeditious transfer of this property.

1.3 PROCEDURES

The PA began with a review of Army Housing records located at Fort Devens, Mass., approximately 35 miles northwest of Boston the week of May 15-19, 1989. Additional information was obtained from the Army Corps of Engineers District Office in Waltham, Mass., on May 17 and from conversations with personnel from the office of the Area Engineer, Fort Devens on May 18. A site visit was conducted at Beverly, Mass., on May 16, 1989, at which time additional information was obtained through personal observations of ANL investigators. ANL investigators revisited the property on August 4, 1989, at which time the interiors of two of the units (#44 and #42) were visually inspected for the possible presence and condition of asbestos-containing materials. Photographs were taken of the housing units and surrounding properties as a means of documenting the condition of the housing units and immediate land uses. Site photographs are appended.

All available information was evaluated with respect to actual or potential releases to air, soil, and surface and ground waters.

2 PROPERTY CHARACTERIZATION

2.1 GENERAL PROPERTY INFORMATION

The Beverly housing area is located on Laurel Street, in the north part of the town of Beverly, Essex County, Massachusetts, about 20 miles northeast of Boston. The facility occupies 5.36 acres of land in fee and 0.14 acre in easements.

The 16 houses of the facility line both sides of Laurel Street. They were built in 1958,² and no additional major construction has taken place since that time. The Army Corps of Engineers office for the southeast Boston area, located in Waltham, Mass., is responsible for major renovations and upgrading within the facility. Routine maintenance is conducted by the Directorate of Engineering and Housing at Fort Devens, Mass.

Figures 1 and 2 show the general location of the facility.

2.2 DESCRIPTION OF FACILITY

Figure 3 presents the site plan of the housing property.

Housing Units

Each of the 16 houses of the facility (see appended photographs) is a single-family unit comprised of three bedrooms and a living-dining area, with an attached carport and a storage room (the "capehart" style, a name given it by the builder, National Homes).³ The houses are built on concrete slabs covered with tile.³ Walls are covered inside with sheetrock panels and outside with piywood originally covered with asbestos shingles but later covered over again with vinyl siding. The roofs of the houses are made of asphalt shingles on wood sheathing. In the rear of each house is a concrete slab patio. A driveway and a pathway connect each house to the street.

Utilities

No water wells exist on the property, and each house has been supplied with city (Beverly) water since initial construction. The city also provides electric power and telephone lines. Solid wastes are collected by a private local contractor and disposed of off-site.

Sewage

Sanitary waste disposal has been provided by the Beverly municipal sewer network since initial construction of these housing units. The area's main sewer line is buried in the middle of the property, with feeder lines extending to each house, and is

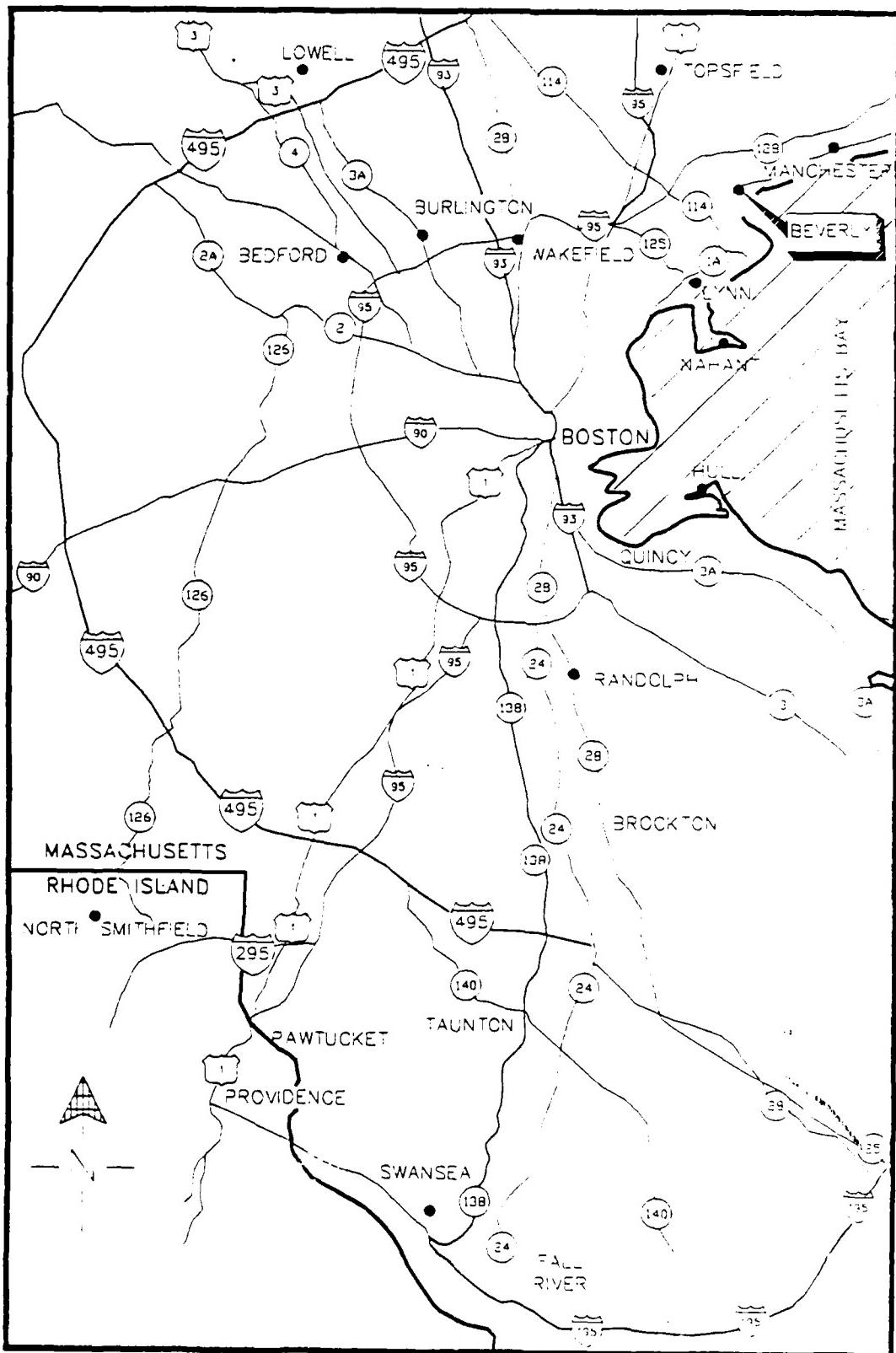


FIGURE 1 Location Map of Massachusetts Army Housing Facilities

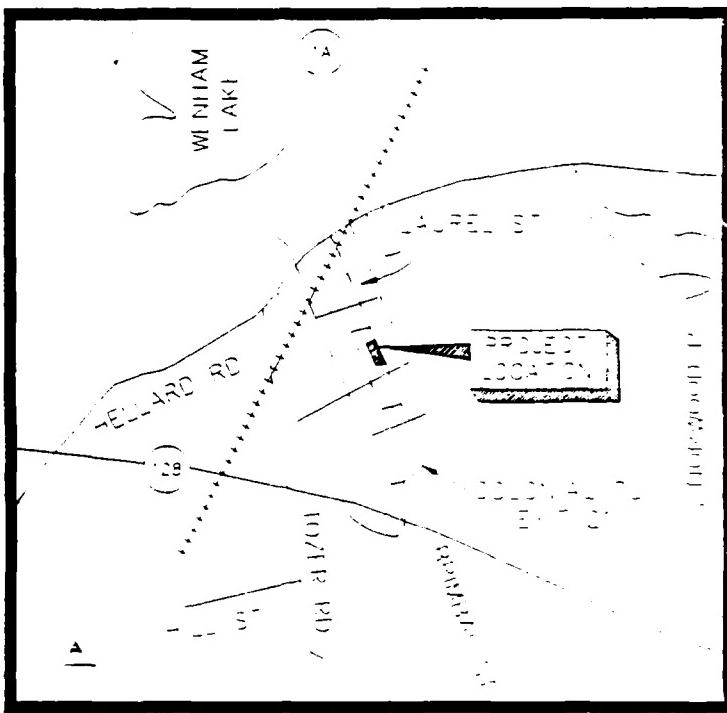


FIGURE 2 Vicinity Map of Beverly Army Housing Units

connected to the main sewer line under Brimbal Street, on the west side of the property. No sewage problems have been reported at the facility.

Fuel Storage

Heating of the houses is by forced-hot-air furnaces. Fuel oil was initially stored in 275-gallon underground tanks (installed during original housing construction), but in 1986 all underground tanks were removed and replaced with above-ground tanks located at the rear of each of the houses.

Storm Drainage System

The area is drained by an open paved ditch, surface run-off, and by the storm sewer running for 1,420 feet westward outside the property.^{2,4} The storm sewer of the facility is connected to the Beverly system, while the surface run-off and the open ditch empty rain water into a brook running through the northwestern borders of the property.⁴ This property is not located in a flood plain.²

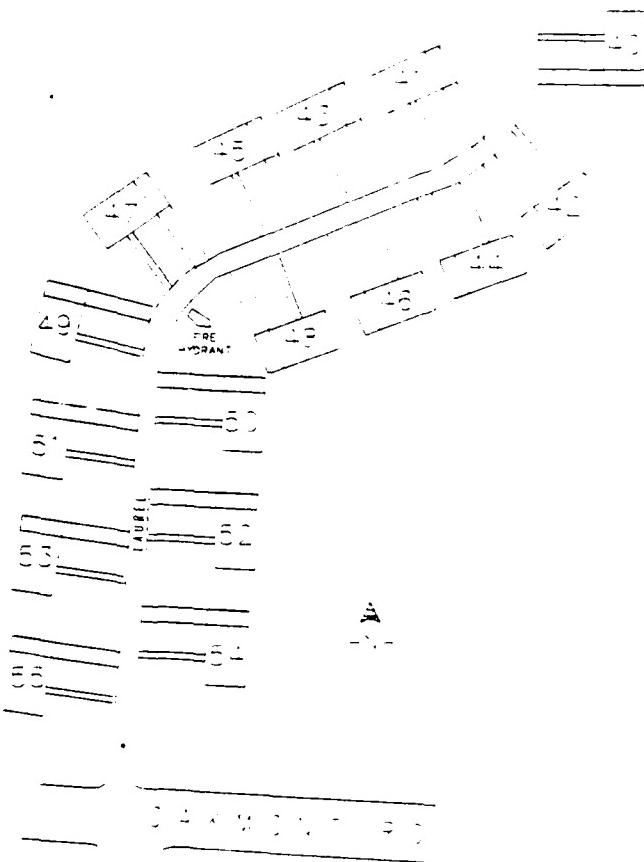


FIGURE 3 Site Plan Map of Beverly Army Housing Units

Other Permanent Structures or Property Improvements

Since the development of the property and the construction of the houses, no other permanent structures were erected. However, in 1962 there was a problem with drainage from the housing area. Then, the federal government entered into a special agreement with the town of Beverly to correct the problem. The correction consisted of installing 36" lines on the property, removing the headwall (located about in the middle of the west border of the facility), and installing a new line from the headwall site to the town system.⁴ Since a drainage problem persisted, the Fort Devens maintenance unit installed a drop inlet on the property (middle of the west border) and connected it to an existing manhole on the adjacent private property, which finally remedied the problem.⁴

2.3 PROPERTY HISTORY

2.3.1 Nike Defense Program and Typical Battery-Level Practices

Generic information on the national Nike antiaircraft defense program has been compiled in two studies, one commissioned by the Army Corps of Engineers⁵ and the other by the U.S. Army Toxic and Hazardous Materials Agency.⁶ In both studies, independent contractors relied on information contained in unclassified documents related to the Nike surface-to-air missile program, including engineering drawings and specifications (for the facilities and the missiles themselves), interviews with Army personnel participating in the Nike program, and operations manuals and directives relating to the operations and maintenance of Nike facilities. Taken together, these two reports represent the most complete assemblage of generic information on the Nike missile program from an environmental perspective. Salient points from both reports are condensed below.

At its zenith in the early 1960s, the Nike program included 291 batteries located throughout the continental United States. The program was completely phased out by 1976, with many of the properties sold to private concerns or excessed to state or local governments for nominal fees.

Nike Ajax missiles were first deployed in 1954 at installations throughout the continental United States, replacing, or in some cases augmenting, conventional artillery batteries and providing protection from aerial attack for strategic resources and population centers. Typically, Nike batteries were located in rural areas encircling the protected area. The Ajax was a two-stage missile using a solid-fuel booster rocket and a liquid-fuel sustainer motor to deliver a warhead to airborne targets.

The Ajax missile was gradually replaced by the Nike Hercules missile, introduced in 1958. Like the Ajax, the Hercules was a two-stage missile, but it differed from the Ajax in that its second stage was a solid-fuel rather than liquid-fuel power source and its payload often was a nuclear rather than conventional warhead. Ajax-to-Hercules conversions occurred between 1958 and 1961 and required little change in existing Nike battery facilities. A third-generation missile, the Zeus, was phased out during development and consequently was never deployed.

A typical Nike missile battery consisted of two distinct and separate operating units, the launch operations and the integrated fire control (IFC) operations. The two operating areas were separated by distances of less than two miles, with lines of sight between them for communications purposes. A third separate area was also sometimes part of the battery. This area was typically equidistant from the two battery operating sites and contained housing for married personnel assigned to the battery. Occasionally, these housing areas also contained battalion headquarters, which were responsible for a number of Nike batteries.

Depending on area characteristics and convenience, the housing areas were often reliant on the launch or IFC sites for utilities such as potable water, electrical power, and sewage treatment. In those instances, buried utility lines connected the housing area

to one or both of the other battery properties. It is also possible, however, that housing areas were completely independent of the missile launcher and tracking operations. In those instances, the necessary utilities were either maintained on the housing site or purchased from the local community. In many localities, as the character of the land area around the housing units changed from rural to suburban or urban, communities extended utility services to the housing unit locations, in which case conversions from independent systems to community systems were made.

A large variety of wastes was associated with the operation and maintenance of Nike missile batteries. Normally encountered wastes included benzene, carbon tetrachloride, chromium and lead (contained in paints and protective coatings), petroleum hydrocarbons, perchloroethylene, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, and trichloroethylene. Because of the rural locations of these batteries, and also because very few regulatory controls existed at that time, most of these wastes were managed "on-site." (Unused rocket propellants and explosives, however, would always have been returned to central supply depots and not disposed of on-site.) It is further conceivable that wastes generated at one of the Nike properties may have been transferred to its companion property for management or disposal.

Wastes related to missile operation and maintenance would not have been purposely transferred from a battery operating area to a housing area with no facilities for waste management or disposal. In some instances, however, the sewage treatment facilities for all Nike battery properties were located at the housing area; that possibility cannot be automatically ignored. Finally, where housing areas received various utilities from either of the operating areas, it is also possible that wastes disposed of on those other properties may have migrated to the housing area via the buried utility lines. And since decommissioning of the Nike batteries did not normally involve removal of buried utility or communication lines, any such contaminant migration is likely to have gone unnoticed.

2.3.2 Beverly Housing Units

The 16 Beverly housing units were built in 1958 to provide family housing to military personnel assigned to the Nike missile battery in Beverly, Mass. There is no documentation indicating that missile-related wastes were ever delivered to managed at this property. Furthermore, this housing area has always operated independently of the rest of the Nike battery with respect to water, sewer, and electrical utilities.

During construction, the road was paved, side walks and a storm sewer were installed, an open drain ditch was paved, and a 275-gallon underground tank for fuel-oil was installed at each house.² Hot water facilities consist of 80-gallon electric water heaters.³

The site investigation revealed that vinyl siding was installed over the original asbestos siding of each house. The date of this action is not documented, but the action was confirmed by the Army Corps Engineers office in Waltham. It is assumed that the siding was added for cosmetic reasons and that the original siding was still in good condition and left in place.

Since original construction in 1958, no new structures have been built or major alterations made. The storm drainage system was corrected. A smoke/heat detector was installed in each house in 1979.³

Visual inspection of the interiors of units #42 and #44 showed water pipe insulation to be in excellent condition.

2.4 ENVIRONMENTAL SETTING AND SURROUNDING LAND USE

The town of Beverly had an estimated population of 36,100 in 1980.⁷ Its economy is based on fishing and manufacturing. The area is generally hilly land (most elevations are 100 feet or less), drained through groundwater and tributary streams that feed Bass River and Wenham Lake.⁸ The town lies within the New England Seaboard lowland.⁸

The Beverly housing area is situated on a slope, with each house built on a step-like terrace of the slope. The area behind the houses on the south and southeast sides of the facility has been steeply graded and forms the property boundary. The western side of the property has been filled to form a gentle slope down to a row of small trees.

2.5 GEOLOGIC AND HYDROLOGIC SETTINGS

Beverly is located in the Coastal Drainage Basin of the New England Physiographic Province. The topography of the area is typified by low, rounded hills rising out of the swampy lowland and by a number of lakes, ponds, and creeks. Lowlands range in elevation from sea-level to approximately 350 feet at the tops of many small rolling hills. Lowlands lack a clearly defined drainage pattern and are poorly drained. The streams in the area have low gradients. Poor drainage and low relief result in numerous wetlands.⁹

Mean annual temperature is about 50° F. Mean annual precipitation in the area is about 44 inches per year, of which 28 inches evaporates and transpires.¹⁰ Part of the remainder travels overland directly to streams and, during or immediately after storm periods, makes up a large part of the increased streamflow. However, most of the water not evaporated or transpired percolates through the ground to the water table and then moves to streams, where it becomes the major component of annual streamflow. Groundwater discharge may be as much as two-thirds of the average annual runoff and, in unregulated streams, is commonly the sole supply for streamflow during low-flow periods. The 1-year 24-hour rainfall is about 2.5 inches in this area.

Soils of the study area have formed since the retreat of the Wisconsin ice sheet.¹¹ Soil development reflects the influence of glaciation. Generally, the Paxton-Hollis-Canton and the Canton-Paxton-Merrimac soil associations have formed on the upland hills and ridges that are mantled with glacial till. The Hinckley-Windsor-Much association has formed on glacial outwash deposits and the Dune Land-Tidal Marsh-Beaches association has formed along the coast.

Unconsolidated glaciofluvial deposits of sand and gravel constitute the principal aquifers in the area. A crystalline bedrock aquifer beneath the unconsolidated deposits is of secondary importance. The crystalline-bedrock aquifer consists primarily of igneous and metamorphic rocks, including Dedham grano-diorite of Devonian age, a Pre-Cambrian Marlboro formation, and Carboniferous-age metamorphic rocks. The rocks have been folded, fractured, and faulted. Bedrock exhibits low porosity, specific yield, and hydraulic conductivity. Wells drilled in bedrock for domestic water supplies are commonly 100 to 300 feet deep and generally yield a few gallons per minute.

The unconsolidated deposits are composed of till, stratified drift, wind-laid, wetland, alluvial, and beach and dune sediments. The till is of two types, an upper till and a lower one. Generally, lower till has a high content of silt and clay and is dense, compact, fine-grained, and poorly sorted. Upper till usually contains larger amounts of sand, cobbles, and boulders, a wider range of grain sizes, and is less compact. Both tills are unfavorable for development of municipal water supplies. Stratified drift consisting of glaciofluvial deposit of ice-contact, outwash, and marine sediments overlies most of the till. Ice-contact and outwash deposits are major water-bearing units in the basin. Ice-contact deposits are predominantly sand and gravel, with a small percentage of silt and clay. Outwash deposits are composed mostly of sand, with small amounts of silt, clay, and gravel. Wetland deposits are found overlying outwash in the lowlands, till in the upland depressions, and tidal flats along the coast. They consist of peat and muck intercalated with silt and sand. Porosity of wetland deposits is large, but the vertical hydraulic conductivity is very low. Wind deposits, alluvium, and beach and dune deposits comprise only a small portion of the basin.¹⁰

Till and bedrock are major aquifers in the Beverly area. Precipitation is the principal source of recharge to the groundwater aquifer. Direct infiltration of rain and snow melt into outcrops of outwash, ice-contact, and wetland deposits acts as the primary recharge mechanism; because of low hydraulic conductivity and steeper slopes, recharge through till and bedrock outcrops is minimal. Discharge of groundwater in the basin is mainly from well pumping, evapotranspiration, and seepage to ponds, springs, wetlands, and streams. Water-table levels are generally highest in the late winter and spring and lowest in the late summer and fall.

Diversions from the Ipswich River and surface-water reservoirs supply the City of Beverly. Diversions are limited by legislation to specified minimum streamflows from December through May, and to total volumes of water. Water in the Ipswich River is chemically compatible with domestic and industrial uses. The water is weakly alkaline to weakly acidic and soft to moderately hard. The predominant cation and anion are calcium and bicarbonate, respectively. Surface water in the basin received a B water-use classification from the Massachusetts Division of Water Pollution Control.¹² The 1978 water quality survey of the Ipswich River basin by that division reported a mean turbidity of the Ipswich River as 1.9 turbidity units. Groundwater quality is generally within the recommended concentration limits for chemical constituents except for manganese and iron. Iron- and manganese-bearing minerals present in geologic formations cause unacceptable concentrations of iron and manganese in the groundwater. Water-treatment facilities are used to remove the objectionable concentrations of these constituents. The total water use in Beverly was about 1,550 million gallons in 1974.

3 ENVIRONMENTALLY SIGNIFICANT OPERATIONS

3.1 SEWAGE AND STORM DRAINAGE SYSTEMS

Facility sewage is transported by a sewer network connected to each house through a central line ending at the main sewer system of Beverly. No sewage problems have been reported at the housing facility.

Past heavy rains have caused flooding and drainage problems, primarily because of limitations in the storm sewer.⁴ The corrective actions discussed in Sec. 2.2 (under "Other Permanent Structures or Property Improvements") have successfully mitigated the stormwater drainage problems.

3.2 FUEL-OIL STORAGE TANKS

Currently, no underground fuel-oil storage tanks exist in the area. The former underground 275-gallon tanks have been removed from in front of each house and replaced in 1986 by above-ground tanks located behind each house. No soil tests were performed in the excavations, but reportedly no leaks were suspected when the tanks were excavated and no contamination was visually identified at the time of the tank removals.

Some of the current above-ground tanks evidenced oil spilled around them, from accidental leakage during the filling procedure. However, the volumes of fuel involved appear to have been very small, and no significant adverse environmental impacts are believed to have resulted.

4 KNOWN AND SUSPECTED RELEASES

No releases are known or suspected to have occurred at the facility or its surrounding area. No hazardous materials or hazardous wastes have been reported on-site, and no evidence of contamination from housing activities has been documented or observed.

Stormwater drainage problems, first encountered in 1962, were successfully remediated with changes to the engineered drainage network and have not reoccurred.

5 PRELIMINARY ASSESSMENT CONCLUSIONS

Although these housing areas were originally developed in support of a Nike missile program, all available documentation and circumstantial evidence suggest the fully independent operation of this housing property from other Nike activities. No Nike-related wastes were delivered to this property for management or disposal. Furthermore, since this property was independent of the Nike missile operations with respect to all necessary utilities, there is no possibility of migration of Nike-related wastes along buried utility lines.

At the time of their replacement in 1986, the underground heating oil tanks, originally installed in 1958, were 28 years old. However, those individuals present during the tank removals have confirmed that the tanks were replaced as a matter of good engineering practice, and not because of suspected or actual leaks. No leaks were found and no contamination was observed in the tank excavations at the time of the tank removals.

6 RECOMMENDATIONS

The Beverly housing facility does not present an imminent or substantial threat to human health or the environment. There is no evidence to suggest that hazardous or toxic compounds have ever been released from this property. No remedial actions are therefore warranted before excessing this facility.

The conclusion assumes this property will most likely continue to be used for residential housing.

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APPENDIX:

**PHOTOGRAPHS OF BEVERLY HOUSING FACILITY
AND SURROUNDING LAND**

Upper Left-hand Photo

Upper Right-hand Photo

Lower Left-hand Photo

Lower Right-hand Photo

BEVERLY, MASSACHUSETTS

(All photographs for this housing area were taken 5/16/89.)

Page 1:

Upper left-hand photo:
Capehart house with carport.

Upper right-hand photo:
Blank

Lower left-hand photo:
Street view of housing units.

Lower right-hand photo:
Wood fence surrounding 275-gallon aboveground heating oil tank at
rear of house.

